Some Attempts for Internationalization at Maritime and Urban Engineering Program in Graduate School of Osaka University

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Abstract
Much interest and emphasis in the education is placed on internationalization these days, and in fact various international programs are operated, mostly accepting international students with the Japanese government scholarship. The International Program of Maritime and Urban Engineering at Osaka University is one of them admitted in 2014 by the MEXT. However, one of the distinctive features in this program is that almost all lectures for the graduate course are given in English for both international and Japanese students in the same classrooms. This paper introduces some attempts particularly in order for Japanese students to come along with the lectures and to have friendly and competitive interactions with foreign students. To carry out these attempts continually and to enlighten the students to study harder, the professors must be tenacious and above all must be passionate in preparation and implementation of their lectures in English.

Keywords: Maritime and Urban Engineering, Lectures in English, Seminars, Internationalization

1. Introduction

The International Program of Maritime and Urban Engineering was admitted in 2014 by the MEXT (Ministry of Education, Culture, Sports, Science and Technology) after competitive selection among 180 applications submitted from universities and institutions throughout Japan, and it started from October 2014, with 6 preferential slots for foreign students with the Japanese government 5-year scholarship.

This paper introduces some distinctive features in this Maritime and Urban Engineering Program. Especially, as one of the important features, almost all lectures (exactly saying, not all unfortunately at present) are given in English not only for international students but also for Japanese students in the same classrooms. To be honest, it is not easy for us Japanese professors to provide the lectures in English using not-so-good command of English conversation. However, more seriously, Japanese students are likely to have difficulties in the class, because their knowledge about fundamental English expressions (for instance in relation to mathematical expressions) is far below our expectation, and thus we are making various efforts to have the students stimulate and study harder. Those efforts are introduced with my lecture taken as an example. Other important features incorporated in the 5-year program to enhance and guarantee the academic “quality” of international students are also introduced, with emphasis placed on the interdisciplinary cross-boundary seminar.

In order to educate the students especially to make Japanese students international, it is important to provide them with opportunities for stimulating and encouraging interactions between Japanese and international students, but much more importantly Japanese professors must be passionate in preparation and implementation of their lectures in English, which is emphasized in this paper.

2. Background of the Maritime and Urban Engineering Program

Observing natural disasters incurred in 2011 in the Tohoku district of Japan by huge earthquake, associated big destructive tsunami, subsequent damage of nuclear power plants, and also seasonal huge typhoons such as No. 30 attacked a middle part of Philippine, we could recognize strongly the importance of safety and protection of local and global environments. These kinds of need from the society exist not only in Japan but also in densely-populated cities in Asian countries. Considering these, we realized that much effort should be made for the research and education on the following modern themes connected to Maritime and Urban Engineering:

- Prevention and mitigation of natural disaster
- Protection of maritime and urban environment
- Development of renewable energy and energy-saving technologies
- Safety measures, risk assessment, and new transportation system
- Synthesized design of space, ocean and land

In response to the public announcement made at the year-end of 2013 by the MEXT, inviting proposals of any kind of special program providing preferential slots with Japanese government scholarship for foreign students, we have proposed a new International Program of Maritime and Urban Engineering which aims to bring up international and Japanese students through the research and education on the themes described above.

After stringent evaluation of application documents submitted from 180 institutions throughout Japan and subse-
quent interview at the MEXT, our new program proposed was fortunately admitted in March 2014 as one of the 41 programs finally accepted. In our special program on Maritime and Urban Engineering, 6 preferential slots are provided for foreign students to study with Japanese government scholarship for 5 years.

3. Aims and Features of the Maritime and Urban Engineering Program

With this scholarship support from the MEXT, we have recruited excellent foreign students and started the program from October 2014, with aim to do the followings:

- Nurturing younger scientists who will be able to lead the academic society in the modern Maritime and Urban Engineering and succeed the knowledge to the next generation with leadership of mutual trust and partnership.
- Establishment of international environment for both Japanese and international students for studying hard in friendly rivalry, by providing them with various opportunities of high-level and quality-emphasized academic interactions.

This International Program of Maritime and Urban Engineering is being operated by the Division of Global Architecture in the graduate school of Osaka University which is comprised of three Departments: (1) Naval Architecture & Ocean Engineering, (2) Civil Engineering, and (3) Architectural Engineering. Thus we can cover wide research areas related to offshore, coastal, onshore, and urban infrastructures, and encompass all kinds of mobility of ships, trains, and automobiles. Therefore we are confident in directing and educating students on exciting technologies and theories requisite in the Maritime and Urban Engineering.

One of the important features in the Program is that the lectures are being given in English. Exactly not all lectures, but at least at the Department of Naval Architecture & Ocean Engineering, all lectures in the graduate school have been conducted in English even for Japanese students since 2007. Therefore at present, it is possible for both Japanese and foreign students to take identical top-level lectures and education, delivered in English, in the same classrooms. This tradition is succeeded to the International Program of Maritime and Urban Engineering.

4. Example of Lecture in English

As an example from the lectures given in English, let me explain some features in my own lecture. The title of my lecture is ‘Wave-body Interaction Theory’, which is basically hydrodynamics including many mathematical equations and their transformation such as differentiation, integration, substitution, and the like. Therefore, without any preparation, students are most likely to be amazed at many unknown English words in addition to difficulty in understanding the theories in the hydrodynamics. Thus in the first class, together with general guidance, explanation will be made on fundamental mathematical expressions in English, starting with addition, subtraction, multiplication, division, numerator, denominator, radius, diameter, and so on. Then in the second class, a short examination is arranged to confirm whether the students memorize all mathematical expressions (about 140 in total) explained and whether they can write correct spelling of those words. Normally most of the students can get very satisfactory score, because I declare that the examination will be repeated until they can get a score higher than 80.

A hand-made textbook written in English using LaTeX software is prepared and its PDF file is uploaded at the specified web page in order for the students to download and study beforehand. However, contrary to my expectation, students do not study diligently in general. In order to put the pressure again for preparation, I ask the students to check unfamiliar words appearing in the lecture note to be explained next week, write the meanings of those words in their own notes, and submit a copy of the note as a proof of preparation. In addition, a quiz will be prepared at every lecture to review what they had studied in the previous lecture and to confirm how much they understood. Shown in Fig. 2 is an example of the answer for the quiz prepared for the review of what was explained in the first class this year.

As can be seen in this example of the quiz, confirmation of some English words (which may be difficult for students but should be memorized correctly) is intended in addition to the review of the contents of the lecture; in this example the derivation of some key equations explained last week. In spite of this kind of effort, the results of answer by the students are normally discouraging. Thus to overview what has been explained, some supplementary notes will be prepared for summarizing important parts of the lecture note, which is beneficial in my explanation in English as well, because overviewing important points after explaining the details can be a good review for myself. Supplementary notes are sometimes prepared also for showing details of the derivation of some seemingly difficult equations, which may be useful for students to review later and also for me to reduce the time for explaining details in the lecture.
It is also important to provide students with an opportunity to work on some assignments and write a report in English. I make it a rule to return the reports to the students after checking how much they made efforts, writing some comments, and correcting sometimes mistakes and English writing in their reports. Honestly it is tough to prepare a quiz and a sample of its answer for every lecture and to check and return all the reports with some comments. But what is important in our lectures and education is to have passion and also not to slight our work. That is what the education is all about. Another important factor in the international education is that we must be internationally top-level as a researcher in our professional society, which can be a source of confidence in teaching, and our confidence and passion in the lecture can be transmitted implicitly to the students. What should be emphasized here is that the subject of my lecture is elective, not compulsory, but most of the students will take my lecture and not give up until the end despite the need of hard study and passing the sem- ster-end examination.

5. Other Important Features in the Program

In addition to providing the lectures in English, several ideas are incorporated in the International Program of Maritime and Urban Engineering to stimulate the students and to make them recognize the “quality” to be guaranteed. Fig. 3 depicts overall explanation for the 5-year course of Maritime and Urban Engineering Program. Some ideas incorporated in this special program can be summarized as follows:

1) An intensive short-term course will be organized, if necessary, to guarantee the fundamental knowledge for starting the course with Japanese students. (International students tend to be inferior in mathematics or mechanics, because of the start from October.)

2) The interdisciplinary (cross-boundary) seminars will be arranged, in which all international students are required to give presentation on the progress of the special research, to learn how to make good presentation and to widen the spectrum of professional knowledge.

3) At the end of the second year (first stage), rigorous evaluation will be conducted on the achievement and academic level of the students. If the result is below the requirement, a concentrated short term special training program must be taken.

4) In the Qualification Test Part I, the students will be required to write a proposal of the research plan for the doctoral course, a review of the state of the art in a desired research theme, and give a presentation on the plan and review, followed by discussions with professors.

Theory of Ship Waves (Wave-Body Interaction Theory)

Quiz No. 2, April 20, 2016

Write the meaning of the following words in Japanese or in other ways in English.

Year Name:

(1) conservation of mass  运动量保存
(2) conservation of momentum 運動量保存
(3) viscous effects  粘性影響
(4) stress  極限する
(5) normal pressure  法線圧力
(6) prescribed volume  標準された体積
(7) pressure  压力
(8) differentiable  微分可能な
(9) bear in mind  心に留める
(10) be denoted by  〜で表される
(11) variation  変化
(12) adjacent surfaces  隣合う表面
(13) be composed of  〜で構成される
(14) integral  被積分関数
(15) be referred to as  〜と称せられる
(16) partial differential equation  偏微積分方程式
(17) hold for  〜に対して成り立つ
(18) incompressible fluid  非圧縮性流体
(19) continuity equation  連続方程式
(20) substiutable derivative  実質微分

Let us consider a general volume integral of the form

\[ J(t) = \iiint_{V(t)} F(x,t)\,dV. \]

The time derivative of \( J(t) \), which is known as the transport theorem, can be written as

\[ \frac{d}{dt} \iiint_{V(t)} F(x,t)\,dV = \iiint_{V(t)} \frac{\partial F}{\partial t} \,dV + \iint_{\partial V} F \cdot n \,dS. \]

where \( U_0 \) denotes the normal velocity of the boundary surface \( S \).

By using this transport theorem and Gauss’ theorem together with \( U_0 = -\sum x_i n_i \), the principles of conservation of mass and momentum expressed by

\[ \frac{d}{dt} \iiint_{V(t)} \rho \,dV = 0 \]

can be transformed as follows:

\[ \iiint_{V(t)} \frac{\partial \rho}{\partial t} \,dV + \iiint_{V(t)} \rho \frac{\partial u_i}{\partial x_i} \,dV = \iint_{\partial V} \rho u_i n_i \,dS + \iiint_{V(t)} \left[ \frac{\partial}{\partial x_i} \left( \rho u_i \right) \right] \,dV \]

\[ \rightarrow \frac{\partial}{\partial t} \iint_{V(t)} \rho \,dV = \iiint_{V(t)} \frac{\partial}{\partial x_i} \left( \rho u_i \right) \,dV \]

\[ \rightarrow \frac{\partial}{\partial t} \iint_{V(t)} \rho \,dV = \iiint_{V(t)} \left[ \frac{\partial}{\partial x_i} \left( \rho u_i \right) \right] \,dV \]

\[ \rightarrow \frac{\partial}{\partial t} \iint_{V(t)} \rho \,dV = 0. \]

Fig.2: Example of quiz prepared for the review at every class.

Fig.3: Illustrative explanation of 5-year course of Maritime and Urban Engineering Program.
5) During the doctoral course, the students shall be involved in the International Research Meeting through organization, preparation, and presentation on the progress of the doctoral special research.

6) The Qualification Test Part II consists of the defense of dissertation and a trial lecture by the students on a research topic assigned in advance by their supervisors to check their understanding and capability in teaching.

6. Cross-Boundary Seminar

Once students have been assigned to the laboratories of their interests, the research activities tend to be limited within their laboratories and there might be no academic interactions in spite of studying in the same program. The cross-boundary seminar is intended to provide both students and supervising professors with opportunities to know what research themes are being investigated in other laboratories (especially in other Departments) and to recognize relative academic level of the students through comparison with completeness in the presentations by other students. Supervising professors are requested to participate in the seminar and discussions after each presentation to understand what or how the students are doing, what problems they face, and the current level of achievement. Professors are responsible for encouraging the students with constructive comments on their presentations.

Basically the cross-boundary seminar is held once a month, principally on the last Thursday of each month, and three persons will be assigned as the speakers at each seminar. The speakers are normally the international students in the special program, but these days Japanese students are also encouraged to give presentations to activate interactions between Japanese and international students with friendly but competitive atmosphere.

The announcement of the seminar is made via email and the homepage of the Program, and a flyer is prepared every time for informing the contents and schedule of the seminar. An example of the flyer is shown in Fig. 4.

The arrangement of the seminar, including selection of the speakers and preparation of the flyer, had been done by myself for the first year starting from October 2014. However, from the second year, two students have been assigned as the organizer to take care of the seminar, because I realized that taking the leadership in this kind of organization would be a good experience and education for students to become international leaders in the future. Those organizers of the seminar are being changed at every semester to provide a chance to as many students as possible.

One issue at present in this seminar is that the number of professors attending this cross-boundary seminar is very few every time. Needless to say, having discussions with other professors and letting as many professors as possible know the situation of the students through the presentation must be important and can be a good motivation for students to study harder. In that sense, we professors must be more serious and much more passionate in educating the students. We must admit that the professors tend to be hesitant about being international, and thus an important key for internationalization in the education may exist in removal of mental barrier in the professors.

7. Concluding Remarks

In my experience through management for the International Program of Maritime and Urban Engineering, what is important in making students become international is to give the lectures with passionate preparation and confidence endorsed by top-level research and to provide opportunities for friendly and competitive interactions between Japanese and foreign students, which can enlighten the students to study harder and consequently enhance themselves. A key point for internationalization might be to nurture younger professors who have ample international experiences and are free from inferiority complex in English.

Biography

Masashi Kashiwagi is a Professor of Naval Architecture & Ocean Engineering in the Division of Global Architecture at Osaka University. He received his BE, ME and DE in Naval Architecture from Osaka University in 1978, 1980 and 1984, respectively. His research interests include ship hydrodynamics related to waves. He is Editor-in-Chief of Applied Ocean Research, and has organized and hosted many international conferences. He is also Emeritus Professor of Kyushu University, since he had served at Kyushu University for 22 and half years.